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PATENT ABSTRACTS OF JAPAN

(11)Publication number : 06-281726
(43)Date of publication of application : 07.10.1994

(51)Int.Cl. G01S 7/48
G01S 17/02

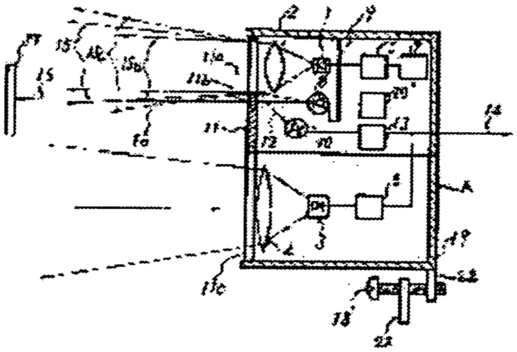
(21)Application number : 05-071544
(22)Date of filing : 30.03.1993

(71)Applicant : MITSUBISHI ELECTRIC CORP
(72)Inventor : MORI AKIHIKO

(54) DISTANCE MEASURING INSTRUMENT

(57)Abstract:

PURPOSE: To easily adjust the optical axis of a distance measuring instrument which finds the distance to an object from the time difference between the transmitting time of light towards the object and receiving time of reflected light form the object by transmitting the light and receiving the reflected light so that the light transmitting direction of the instrument can be accurately aimed at the object and, at the same time, to detect the contamination of a front cover through which the light is transmitted.
CONSTITUTION: The instrument is provided with light emitting means 1, 2, and 5 which emit a light beam for measuring distance towards an object, light receiving means 3, 4, and 6 which receive reflected light rays from the object, and visible light sending means 8 and 20 which are arranged near the means 1, 2, and 5. In addition, light receiving means 10 and 13 for detecting contamination which receive scattered light from a front cover 11 are arranged near the means 8 and 20.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

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CLAIMS

[Claim(s)]

[Claim 1] It has the light transmission means for ranging which emits the light for ranging towards a ranging object, and a light-receiving means to receive the reflected light from said ranging object of the light from this ight transmission means for ranging. In the distance measuring equipment which the front cover which has the part which lets light pass ahead of said light transmission means for ranging is allotted, and measures the distance to a ranging object by the light transmission time of day from said light transmission means for ranging, and the light-receiving time of day in said light-receiving means Distance measuring equipment with which it comes to allot a light sending-out means to send out the light to the front near said light transmission means for ranging.

[Claim 2] Distance measuring equipment with which a light-receiving means for dirt detection to detect the dirt degree of a front cover in response to the scattered light produced in distance measuring equipment according to claim 1 in case the light of a light sending-out means passes a front cover is established.

[Claim 3] It is the distance measuring equipment which it comes to prepare in the location where the optical axis becomes parallel [a light sending-out means] to the optical axis of light transmission **** for ranging in distance measuring equipment according to claim 1.

[Claim 4] The field along which the field along which the light from the light transmission means for ranging passes, the field along which the light from a light sending-out means passes, and the field along which the reflected light which a light-receiving means receives passes are established in a front cover in distance measuring equipment according to claim 1, and the light from said light sending-out means passes is distance measuring equipment made smaller than the field along which the light from said light transmission means for ranging passes.

[Claim 5] Distance measuring equipment which distance measuring equipment according to claim 1 is attached in the supporter material prepared in the supporter material and longitudinal direction which were established in the engthwise direction, and it comes to make movable at the vertical direction and a longitudinal direction in said supporter material.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] Especially this invention relates to amelioration of a means to detect the dirt of the front cover in the equipment which measures distance by time amount after sending out light from a light transmission means to an object until a light-receiving means receives the reflected light from an object, about distance measuring equipment.
[0002]
[Description of the Prior Art] There are some which were indicated by the former, for example, JP,3-30116,B, as distance measuring equipment. The distance measuring equipment indicated by this official report is shown in drawing 3 . Each component etc. is contained by Frame A and distance measuring equipment is covered by the front cover 11 with a transparent front face. The inside of Frame A is divided into every [the half-section], a light transmission-related means is stored in one half-section, and the light-receiving-related means is stored in the half-section of another side. 1 is a light transmission component and light transmission is controlled by the light transmission component drive circuit 5. 2 is a light transmission lens.
[0003] 3 is a photo detector and the light received with the light-receiving magnification means 6 is amplified. 4 is a light-receiving lens. The side in which the means related to light transmission is stored is equipped with the device which detects the dirt of a front cover 11. This device consists of the photo detector 10 for dirt detection, a dirt signal magnification means 13 to amplify the signal of the dirt detected with this component 10, and a display means 21 to display that if the level of dirt reaches a predetermined value.
[0004] Next, the busy condition of this distance measuring equipment is explained. When measuring the distance to an object first, the light transmission component 1 is controlled by the light transmission component driving means 5, and light (in many cases, it is near-infrared light) is sent out. Ready light of this light is carried out with the light transmission lens 2, and it shines upon an object (not shown) through a front windshield 11. It reflects in distance measuring equipment, and this reflected light carries out incidence to the light-receiving lens 4 through said front windshield 11, and ready light is carried out with this light-receiving lens 4, and it can receive the light which shone upon the object by the photo detector 3. The light which was able to be received by the photo detector 3 is amplified with the light-receiving magnification means 6, and range measurement is presented with it.
[0005] Distance R is found by the degree type (1), when light transmission time of day is set to t1 and it sets light-receiving time of day to t2.
R=C/2 (T2-T1) — (1)
By this formula, C is the velocity of light and is 3x108 m/s. In spite of being dirty, when it is possible that a front cover 11 becomes dirty with rain, mud, etc. depending on the operating environment condition of this distance measuring equipment on the other hand, and it is used, range measurement capacity may decline or a measurement error may increase. Said photo detector 10 for dirt detection is used as a means to detect the degree of this dirt. This component 10 receives the scattered light 12 at the time of the light from said light transmission component 1 passing a front windshield 11. This scattered light 12 increases in proportion to the degree of the dirt of a front windshield 11. The scattered light 12 received by the photo detector 10 for dirt detection is amplified with the magnification means 13 for dirt detection, and if the level of the scattered light 12 reaches the predetermined level set up beforehand, it will be warned of it to a user with the display means 21.
[0006]
[Problem(s) to be Solved by the Invention] There was a problem described below in the conventional distance

ıeasuring equipment. That is, this kind of distance measuring equipment has directivity in the beam of light, and : a device-under-test object does not exist in beam divergence, measurement of it has become impossible. ılthough measuring range will spread if beam divergence is enlarged, there is un-arranging [of measurable istance becoming short or detecting the distance to an unnecessary body]. The measurable range becomes arrow, although the maximum detection distance will become long on the other hand if beam divergence is onversely made small.

)007] If it is going to carry out ranging with which practical use can be presented, although a light beam with a ›ng distance which can be ranged, i.e., a comparatively narrow light beam, should be adopted, if it does so, in rder to catch an object certainly, it needs to adjust the optical axis of a light transmission means beforehand, in ase a certain extent installs distance measuring equipment. However, since the wavelength of the light from the ght transmission component 1 was near-infrared light, with the naked eye, it was not visible, therefore had to erform optical-axis accommodation using a special screen and a special special camera, and usually had the roblem that optical-axis accommodation could not be performed simply. this invention — the above — make ptical-axis accommodation easy that a problem should be solved, and let it be a technical problem to be able to e made to perform dirt detection of a front cover with the means moreover used for optical-axis ccommodation.

)008]

Vleans for Solving the Problem] The light transmission means for ranging which emits the light for ranging ›wards a ranging object fundamentally in this invention, It has a light-receiving means to receive the reflected ght from said ranging object of the light from this light transmission means for ranging. In the distance ıeasuring equipment which measures the distance to a ranging object by the time of day which the front cover ʼhich lets light pass ahead of said light transmission means for ranging was allotted, and carried out light ʼansmission from said light transmission means for ranging, and the light-receiving time of day in said light-ɜceiving means The above-mentioned technical problem is solved with the distance measuring equipment by ʼhich it comes to allot a light sending-out means to send out the light to the front near said light transmission ıeans for ranging.

)009]

-unction] In this invention, the light sending-out means is allotted near the light transmission means for ranging, nd accommodation of the direction of the light beam of the light transmission means for ranging of distance ıeasuring equipment is only made to a wall etc. by applying the light, without adding a special means from the bility of the light being emitted to the front with this light sending-out means. The field along which the light for ınging passes, and the field along which the light passes are established in a front cover, if it is made smaller ıan the field where the light for ranging passes along the field along which the light passes, the light beam of the ght used in the case of optical-axis accommodation can be extracted, and optical-axis accommodation can be erformed correctly.

)010] The optical axis of the light and the optical axis of the light for ranging are made more as for parallel, then irection accommodation of the above-mentioned light beam to accuracy. Furthermore, optical-axis ccommodation can perform distance measuring equipment to supporter material movable to the upper and ›wer sides or a longitudinal direction, then by moving this light transmission means to the upper and lower sides r right and left at supporter material in the case of optical-axis accommodation of the light transmission means ›r ranging. If a light-receiving means for dirt detection to, receive the scattered light from the front cover roduced by the light of a light sending-out means in distance measuring equipment on the other hand is stablished, with this means, a dirt degree can be detected and a dirt detection means and an optical-axis ccommodation means can be used together.

)011]

Ξxample] One example of this invention is explained about drawing below. The block diagram in which the istance measuring equipment applied to this invention at drawing 1 and drawing 2 was shown, and drawing 1 howed the configuration of distance measuring equipment in longitudinal section from the side, and drawing 2 re the front views of distance measuring equipment. In drawing 1 , a front cover 11 is attached in the front face f the frame A box-like in distance measuring equipment 19, and a means by which a means to send out the light ›r ranging to the Johan section of drawing in this frame A is arranged, and reflects the light for said ranging in ıe bottom half section is arranged. That is, the light transmission lens 2 which carries out ready light of the light ʼom the light transmission component 1 for ranging which emits near-infrared light, and this component 1 to the ohan section of Frame A, and the light transmission component drive circuit 5 which drives said light transmission component 1 are arranged, and these constitute the light transmission means for ranging. 7 is a distance arithmetic circuit and sends the signal of light transmission initiation to said drive circuit 5.

[0012] The light sending-out means is established near said light transmission means for ranging. This light sending-out means consists of a drive circuit 20 which drives the light sending-out component 8 and this component 8. Said light sending-out component 8 and said light transmission component 1 for ranging are located on the abbreviation same flat surface by one supporter material 9. Moreover, the optical axis of the light sending-out component 8 and the optical axis of said light transmission component 1 for ranging are considered as abbreviation parallel. As for the light sending-out component 8, the horizontal center line is located on the same line as the horizontal center line of the sending-out component 1 for ranging. A dirt detection light-receiving means to receive the scattered light from the front cover of the light near the light sending-out means, and to detect dirt is established. This light-receiving means for dirt detection will consist of an alarm means 14 to generate an alarm tone or a display, if the degree of the amplifying circuit 13 which amplifies the reflected light received with the photo detector 10 for dirt detection in the location which can receive said reflected light, and this component 10, and the scattered light exceeds predetermined level.

[0013] The light-receiving means is allotted to the bottom half section of Frame A. A light-receiving means consists of the condenser lens 4 with which the light from said light transmission component 1 for ranging condenses and carries out ready light of the reflected light reflected in the ranging object 17, a photo detector 3 which receives this condensed light, and an amplifying circuit 6 which amplifies the light received with this component 3. After a light-receiving signal is amplified in this amplifying circuit 6, it is sent to said distance measuring circuit 7.

[0014] First window part 11a which said front cover 11 is glass and is the field through which the light for said ranging passes, Second window part 11b which is the field through which said light for optical-axis accommodation passes, It has 3rd window part 11c which is the field through which the reflected light to said light-receiving means passes, and as shown in drawing 2 , the black coating with which these window parts 11a and 11b and parts other than 11c cannot reflect light easily is applied among front covers 11. As shown in drawing 2 , the 1st window part 11a, light transmission lens 2, and light transmission component 1 are used as this alignment, and also let the 3rd window part 11c, light-receiving lens 4, and photo detector 3 be this alignment. Moreover, it is [0015] by which this 2nd window part 11b is made smaller than said 1st window part 11a while said 2nd window part 11b is used as the light sending-out component 8 and this alignment. As shown in drawing 2 , it is attached in the supporter material 22 of a lengthwise direction, and the lateral supporter material 23, and adjusting screws 18b and 18a are formed in each supporter material 22 and 23, and distance measuring equipment 19 can move distance measuring equipment 19 to the upper and lower sides and a longitudinal direction by adjusting these adjusting screws 18b and 18a.

[0016] Next, the busy condition of the above-mentioned distance measuring equipment is explained. When measuring the distance to an object first, as usual, make the light transmission component 1 drive in the drive circuit 5, and the light for ranging, such as near-infrared light, is sent out. Ready light of this light is carried out with the light transmission lens 2, first window part 11a is passed, it hits against an object 17, and the reflected light from this object 17 is condensed with the light-receiving lens 4, this condensed light is received by the photo detector 3, this is amplified in an amplifying circuit 6, and a light-receiving signal is sent to the distance measuring circuit 7. In the distance measuring circuit 7, the distance to an object is measured using said formula 1) from the difference of the time of day which carried out light transmission, and the time of day which received light.

[0017] Next, optical-axis accommodation of distance measuring equipment is explained. Although it is required that the light from the light transmission means for ranging should be suitable in the predetermined direction, distance measuring equipment 19 adjusts the optical axis of the light transmission means for ranging beforehand before use of distance measuring equipment 19 so that an object may be suited. The light 16 is sent out from the light sending-out component 8, and this light 16 is put in this example to a wall or a screen, and it adjusts so that the light may be suitable in the predetermined direction. In this case, since the light 16 is visible with the naked eye, even if it does not use a special facility, while an accommodation person looks at light with the naked eye, it can adjust. Moreover, the lights 16 are the light from said light transmission component 1, and abbreviation parallel, and since it is sent out from the second window part 11b small moreover, a light beam can carry out correctly [a rat tail and optical-axis accommodation] and finely.

[0018] And the bottom will be turned to, if adjusting-screw 18b is turned to the right and equipment 19 will turn to the left toward the upper part of drawing 1 or drawing 2 that what is necessary is just to move the distance-ıeasuring-equipment 19 whole to optical-axis accommodation along with the supporter material 22 or 23 using he above mentioned adjusting screws 18a and 18b of the supporter material 22 and 23. It is adjusted so that a ght beam 15 may serve as the direction of 15a or 15b (field) by this. If adjusting-screw 18a is turned similarly, ccommodation of a longitudinal direction can be performed.

)019] Next, dirt detection of a front cover 11 is explained. In order that dirt detection may be performed using aid light sending-out means, for example, the light may be sent out from the light sending-out component 8 at ny time while using distance measuring equipment 19, and this light may also pass said first window part 11a. If ıis first window part 11a becomes dirty with rain, mud, or dust with time, the outside surface of first window art 11a will be somber, the scattered light 12 will increase, this scattered light 12 is received by the photo etector 10 for dirt detection, and this is amplified in an amplifying circuit 13. If the degree of the scattered light 2 becomes more than predetermined, an alarm signal 14 will be sent to a warning means, and the dirt of a front over 11 will be told to a user by this. Thus, a light sending-out means can be used for both optical-axis ccommodation and dirt detection.

)020] Moreover, in dirt detection actuation, it can judge that abnormalities occurred for the light sending-out ıeans by detecting that the light-receiving degree in the photo detector 10 for dirt detection becomes close to ero. In addition, in this example, distance measuring equipment is attached near the anterior part bumper of an utomobile etc., and said optical-axis accommodation is beforehand adjusted by the manufacturer and vender ide. Moreover, in said example, the second window part which the light for optical-axis accommodation passes ɔ a front cover may be abandoned, and first window part 11a may be used for optical-axis accommodation.

)021]

Effect of the Invention] Since the light sending-out means is allotted near the light transmission means for anging according to this invention as stated above, ** can also perform optical-axis accommodation of the light ansmission means for ranging without a special facility and equipment by using the light from this light sending-ut means. Moreover, if it is made for the optical axis to become the optical axis of the light transmission means ɔr ranging, and parallel, optical-axis accommodation can perform a light sending-out means to accuracy more. y making it smaller than the field where the light for ranging passes through the field through which the light in front cover passes, the light beam of the light can be made small and optical-axis accommodation can carry ut to a precision more by this.

)022] By making distance measuring equipment movable along with supporter material, it can perform easily ıoving distance measuring equipment to the location used as the optical axis of the request direction. The onfiguration which, on the other hand, detects the scattered light from the front cover produced by the light of light sending-out means with the light-receiving means for dirt detection, then a light sending-out means can e used not only for the object for optical-axis accommodation but for dirt detection, and it is efficient.

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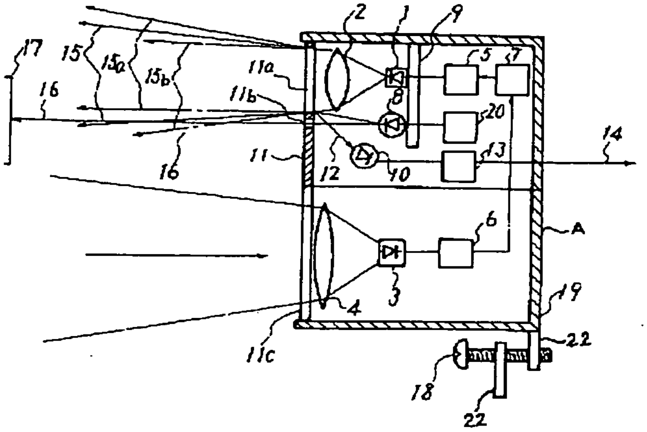
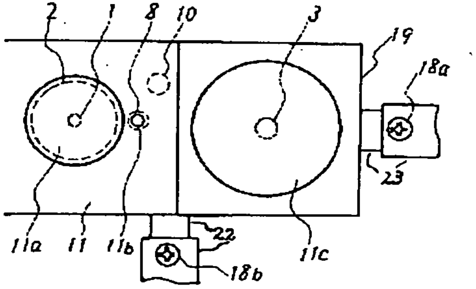
DRAWINGS

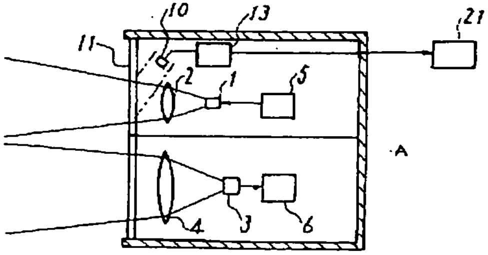
[Drawing 1]



[Drawing 2]



[Drawing 3]



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(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号

特開平6－281726

(43)公開日　平成６年(1994)10月７日

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(51)Int.Cl.^{5}　識別記号　庁内整理番号　ＦＩ

G01S 7/48　Ａ　4240-5J

17/02　Ｂ　4240-5J

審査請求　未請求　請求項の数５　ＯＬ　（全５頁）

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(21)出願番号　特願平5－71544

(22)出願日　平成５年(1993)３月30日

(71)出願人　000006013
三菱電機株式会社
東京都千代田区丸の内二丁目２番３号

(72)発明者　森　昭彦
姫路市千代田町840番地　三菱電機株式会社姫路製作所内

(74)代理人　弁理士　高田　守

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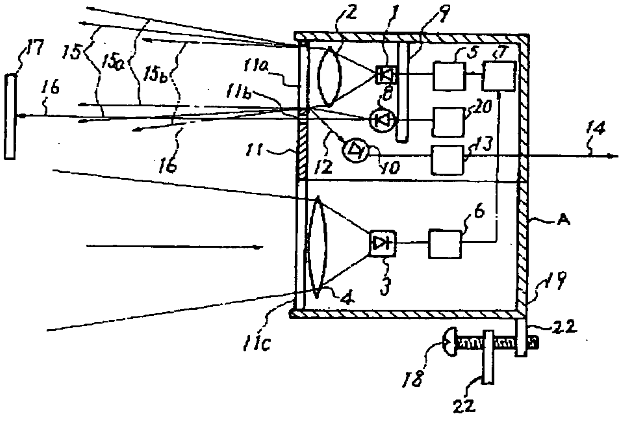
(54)【発明の名称】距離測定装置

(57)【要約】

【目的】　測距対象物へ送光し、対象物からの反射光を受光し、この送光と受光の間の時間から距離を求める装置の、前記送光方向が対象物に正確に向くようにするための光軸調節を容易にし、しかも前記送光が通過する前面カバーの汚れを検知すること。

【構成】　測距用送光手段１、２、５と、この手段からの光の、対象物からの反射光を受光する受光手段３、４、６と、前記測距用送光手段の近傍に配置された可視光送出手段８、２０とが設けられている。また可視光送出手段の近傍には前面カバー１１からの散乱光を受ける汚れ検知用受光手段１０、１３が配置されている。



【特許請求の範囲】

【請求項１】測距対象物へ向けて測距用の光を発する測距用送光手段と、この測距用送光手段からの光の前記測距対象物からの反射光を受ける受光手段とが備えられ、前記測距用送光手段の前方には光を通す部分を有する前面カバーが配され、前記測距用送光手段からの送光時刻と前記受光手段での受光時刻とにより測距対象物までの距離を測定する距離測定装置において、前記測距用送光手段の近傍に前方へ可視光を送出する可視光送出手段が配されてなる距離測定装置。

【請求項２】請求項１記載の距離測定装置において、可視光送出手段の光が前面カバーを通過する際に生じる散乱光を受けて前面カバーの汚れ度合を検知する汚れ検知用受光手段が設けられている距離測定装置。

【請求項３】請求項１記載の距離測定装置において、可視光送出手段はその光軸が測距用送光出段の光軸と平行となる位置に設けられてなる距離測定装置。

【請求項４】請求項１記載の距離測定装置において、前面カバーには測距用送光手段からの光が通る領域と、可視光送出手段からの光が通る領域と、受光手段が受ける反射光が通る領域とが設けられ、前記可視光送出手段からの光が通る領域は前記測距用送光手段からの光が通る領域よりも小さくされている距離測定装置。

【請求項５】請求項１記載の距離測定装置が縦方向に設けられた支持部材および横方向に設けられた支持部材に取付けられ、前記支持部材を上下方向および左右方向に可動とされてなる距離測定装置。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】この発明は距離測定装置に関し、特に送光手段から対象物へ光を送出してから受光手段で対象物からの反射光を受けるまでの時間によって距離を測定する装置における前面カバーの汚れを検知する手段の改良に関する。

【０００２】

【従来の技術】距離測定装置として従来、例えば特公平３－３０１１６号に開示されたものがある。この公報に開示された距離測定装置を図３に示す。距離測定装置は枠体Ａに各素子等が収納され、前面が透明な前面カバー１１で覆われている。枠体Ａ内は半部ずつに仕切られ、一方の半部には送光関係の手段が、他方の半部には受光関係の手段が収められている。１は送光素子であり、送光素子駆動回路５によって送光が制御される。２は送光レンズである。

【０００３】３は受光素子であり、受光増幅手段６によって受けた光が増幅される。４は受光レンズである。送光に関係する手段が収められている側には前面カバー１１の汚れを検知する機構が備えられている。この機構は汚れ検知用受光素子１０と、この素子１０で検知された汚れの信号を増幅する汚れ信号増幅手段１３と、汚れのレベルが所定値に達したらそのことを表示する表示手段２１とからなる。

【０００４】次にこの距離測定装置の使用状態について説明する。まず対象物までの距離を計測する場合は、送光素子１を送光素子駆動手段５で制御して光（多くの場合は近赤外光である）を送出する。この光は送光レンズ２で整光され、前面ガラス１１を通って対象物（図示せず）に当たる。対象物に当たった光は距離測定装置へ反射し、この反射光が前記前面ガラス１１を通って受光レンズ４に入射し、この受光レンズ４で整光されて受光素子３で受けられる。受光素子３で受けられた光は受光増幅手段６で増幅されて距離測定に供される。

【０００５】距離Ｒは送光時刻をｔ１、受光時刻をｔ２とした場合、次式（１）で求められる。

Ｒ＝Ｃ／２（Ｔ２－Ｔ１）…（１）

この式でＣは光速であり、3×10^{8} ｍ／ｓである。一方、この距離測定装置の使用環境状態によっては前面カバー１１が雨、泥等により汚れることが考えられ、汚れているにも拘らず使用していると、距離測定能力が低下したり、測定誤差が増すことがありえる。この汚れの度合を検知する手段として前記汚れ検知用受光素子１０が用いられる。この素子１０は前記送光素子１からの光が前面ガラス１１を通過する際の散乱光１２を受光する。この散乱光１２は前面ガラス１１の汚れの度合に比例して増加する。汚れ検知用受光素子１０で受光された散乱光１２は、汚れ検知用増幅手段１３で増幅され、散乱光１２のレベルが予め設定された所定レベルに達すれば表示手段２１でユーザーに対して警告される。

【０００６】

【発明が解決しようとする課題】従来の距離測定装置には次に述べる問題があった。すなわち、この種の距離測定装置は光のビームに指向性があり、ビームの広がり内に被測定物体が存在しないと測定不可能になっている。ビームの広がりを大きくすれば測定範囲が広がるが、測定可能距離が短くなったり、不必要な物体までの距離を検出したりするという不都合がある。一方、逆にビームの広がりを小さくすれば、最大検出距離は長くなるが、測定可能範囲が狭くなる。

【０００７】実用に供しうる測距をしようとすれば、ある程度は測距可能距離の長い光ビーム、すなわち比較的狭い光ビームが採用されるべきであるが、そうすると対象物を確実にとらえるようにするために、距離測定装置を設置する際に予め送光手段の光軸を調節しておく必要がある。ところが、送光素子１からの光の波長は通常、近赤外光であるので、肉眼では見えず、従って光軸調節は特殊なスクリーンや特殊カメラを用いて行なわねばならず、光軸調節が簡易にできないという問題があった。この発明では以上のな問題を解決すべく光軸調節を容易にし、しかも光軸調節に用いる手段によって前面カバーの汚れ検知もできるようにすることを課題とする。

【０００８】

【課題を解決するための手段】この発明では、基本的には、測距対象物へ向けて測距用の光を発する測距用送光手段と、この測距用送光手段からの光の前記測距対象物からの反射光を受ける受光手段とが備えられ、前記測距用送光手段の前方には光を通す前面カバーが配され、前記測距用送光手段から送光した時刻と前記受光手段での受光時刻とにより測距対象物までの距離を測定する距離測定装置において、前記測距用送光手段の近傍に前方へ可視光を送出する可視光送出手段が配されてなる距離測定装置によって上記課題を解決する。

【０００９】

【作用】この発明では、測距用送光手段の近傍に可視光送出手段が配されており、この可視光送出手段によって前方へ可視光を発することができることから、特殊な手段を追加することなく単に壁などに可視光を当てることによって距離測定装置の測距用送光手段の光ビームの方向の調節ができる。前面カバーに測距用の光が通る領域と、可視光が通る領域を設け、可視光が通る領域を測距用の光が通る領域より小さくすれば、光軸調節の際に使用する可視光の光ビームを絞ることができ、光軸調節が正確に行なえる。

【００１０】可視光の光軸と測距用の光の光軸を平行とすれば、上記光ビームの方向調節がより正確にできる。さらに距離測定装置を支持部材に上下または左右方向に可動とすれば、測距用送光手段の光軸調節の際に該送光手段を支持部材に上下または左右に動かすことによって光軸調節が行なえる。一方、距離測定装置に可視光送出手段の光によって生じる前面カバーからの散乱光を受光する汚れ検知用受光手段を設ければ、この手段によって汚れ度合を検知でき、汚れ検出手段と光軸調節手段を併用できることとなる。

【００１１】

【実施例】以下この発明の一実施例を図について説明する。図１、図２にこの発明に係る距離測定装置を示し、図１は距離測定装置の構成を側方から縦断面的に示したブロック図、図２は距離測定装置の正面図である。図１において、距離測定装置１９は箱状の枠体Ａの前面に前面カバー１１が取付けられ、この枠体Ａ内の図の上半部に測距用の光を送出する手段が配置され、下半部に前記測距用の光を反射する手段が配置されている。すなわち、枠体Ａの上半部には近赤外光を発する測距用送光素子１と、この素子１からの光を整光する送光レンズ２と、前記送光素子１を駆動する送光素子駆動回路５とが配置され、これらが測距用送光手段を構成している。７は距離演算回路であり、前記駆動回路５に送光開始の合図を送る。

【００１２】前記測距用送光手段の近傍には可視光送出手段が設けられている。この可視光送出手段は可視光送出素子８とこの素子８を駆動する駆動回路２０とからなる。前記可視光送出素子８と前記測距用送光素子１とは一つの支持部材９によって略同一平面上に位置されている。また可視光送出素子８の光軸と前記測距用送光素子１の光軸は略平行とされている。可視光送出素子８はその水平方向の中心線が測距用送出素子１の水平方向の中心線と同一線上に位置する。可視光送出手段の近傍には可視光の前面カバーからの散乱光を受光して汚れを検出する汚れ検知受光手段が設けられている。この汚れ検知用受光手段は前記反射光を受け得る位置にある汚れ検知用受光素子１０と、この素子１０で受光された反射光を増幅する増幅回路１３と散乱光の度合が所定レベルを越えると警報音または表示を発生する警報手段１４とからなる。

【００１３】枠体Ａの下半部には受光手段が配されている。受光手段は前記測距用送光素子１からの光が測距対象物１７に当たって反射された反射光を集光して整光する集光レンズ４と、この集光された光を受光する受光素子３と、この素子３で受光された光を増幅する増幅回路６とからなる。受光信号はこの増幅回路６で増幅されてから前記距離測定回路７へ送られる。

【００１４】前記前面カバー１１はガラス製であり、前記測距用の光が通過する領域である第一の窓部１１ａと、光軸調節用の前記可視光が通過する領域である第二の窓部１１ｂと、前記受光手段への反射光が通過する領域である第３の窓部１１ｃとを有し、図２に示すように前面カバー１１のうちこれら窓部１１ａ、１１ｂ、１１ｃ以外の部分は光を反射しにくい例えば黒色塗料が塗布されている。図２に示すように第１の窓部１１ａと送光レンズ２と送光素子１は同心とされ、第３の窓部１１ｃと受光レンズ４と受光素子３も同心とされている。また前記第２の窓部１１ｂは可視光送出素子８と同心とされると共に、この第２の窓部１１ｂは前記第１の窓部１１ａより小さくされている

【００１５】距離測定装置１９は図２に示すように、縦方向の支持部材２２と横方向の支持部材２３に取付けられており、それぞれの支持部材２２、２３には調節ネジ１８ｂ、１８ａが設けられ、これら調節ネジ１８ｂ、１８ａを調節することによって距離測定装置１９を上下、左右方向へ動かすことができる。

【００１６】次に上記した距離測定装置の使用状態を説明する。まず対象物までの距離を測定する場合は、従来と同様、駆動回路５で送光素子１を駆動させて近赤外光などの測距用の光を送出し、この光を送光レンズ２で整光して第一の窓部１１ａを通過させ対象物１７に当て、この対象物１７からの反射光を受光レンズ４で集光し、この集光された光を受光素子３で受光してこれを増幅回路６で増幅し、受光信号を距離測定回路７へ送る。距離測定回路７では送光した時刻と受光した時刻との差から前記式（１）を用いて対象物までの距離が測定される。

【００１７】次に距離測定装置の光軸調節について説明

する。距離測定装置１９はその測距用送光手段からの光が所定方向へ向くことが要求されるが、距離測定装置１９の使用前に予め測距用送光手段の光軸を対象物に合うように調節しておく。この実施例では可視光送出素子８から可視光１６を送出し、この可視光１６を壁やスクリーンに当て、可視光が所定の方向へ向くように調節する。この場合、可視光１６は肉眼で見えるので、特殊な設備を使用しなくても調節者が肉眼で光を見ながら調節できる。また、可視光１６は前記送光素子１からの光と略平行であり、しかも小さな第二の窓部１１ｂから送出されるので、光ビームが絞られ、光軸調節が正確且つきめ細かく行なえる。

【００１８】そして光軸調節には前記した支持部材２２、２３の調節ネジ１８ａ、１８ｂを用いて距離測定装置１９全体を支持部材２２または２３に沿って移動させればよく、例えば調節ネジ１８ｂを右に回すと装置１９が図１または図２の上方へ向き、左へ回すと下側へ向く。これによって光ビーム１５が１５ａや１５ｂの方向（領域）となるように調節される。同様に調節ネジ１８ａを回すと左右方向の調節ができる。

【００１９】次に前面カバー１１の汚れ検知について説明する。汚れ検知は前記可視光送出手段を用いて行ない、例えば距離測定装置１９の使用中に随時、可視光送出素子８から可視光を送出し、この可視光は前記第一の窓部１１ａをも通過するため、この第一の窓部１１ａが経時的に雨、泥やホコリで汚れてくれば第一の窓部１１ａの外表面がくすんで散乱光１２が増加し、この散乱光１２は汚れ検知用受光素子１０で受光され、これが増幅回路１３で増幅される。散乱光１２の度合が所定以上になれば警告手段へ警告信号１４が送られこれによってユーザーに前面カバー１１の汚れが知らされる。このように可視光送出手段を光軸調節と汚れ検知の両方に使用できる。

【００２０】また、汚れ検知動作において、汚れ検知用受光素子１０における受光度合が零に近くなることを検知することにより、可視光送出手段に異常が発生したことが判定できる。尚、この実施例では距離測定装置は自動車の前部バンパー近傍などに取付けられ、前記光軸調節は製造者、販売者側で予め調節される。また前記実施例において、前面カバーに光軸調節のための可視光が通過する第二の窓部を廃して第一の窓部１１ａを光軸調節に使用してもよい。

【００２１】

【発明の効果】以上述べたように、この発明によれば、測距用送光手段の近傍に可視光送出手段が配されているので、この可視光送出手段からの可視光を用いることによって特別な設備、装置を使用せずとも測距用送光手段の光軸調節ができる。また可視光送出手段をその光軸が測距用送光手段の光軸と平行になるようにすれば光軸調節がより正確に行なえる。前面カバーにおける可視光が通過する領域を測距用の光が通過する領域より小さくすることによって可視光の光ビームを小さくでき、これによって光軸調節がより精密に行なえる。

【００２２】距離測定装置を支持部材に沿って移動可能とすることにより、距離測定装置を所望方向の光軸となる位置に移動させることが容易に行なえる。一方、可視光送出手段の光によって生じる前面カバーからの散乱光を汚れ検知用受光手段にて検知する構成とすれば、可視光送出手段を光軸調節用だけでなく汚れ検知にも使用でき効率的である。

【図面の簡単な説明】

【図１】この発明の一実施例に係る距離測定装置を側断面的に示したブロック図である。

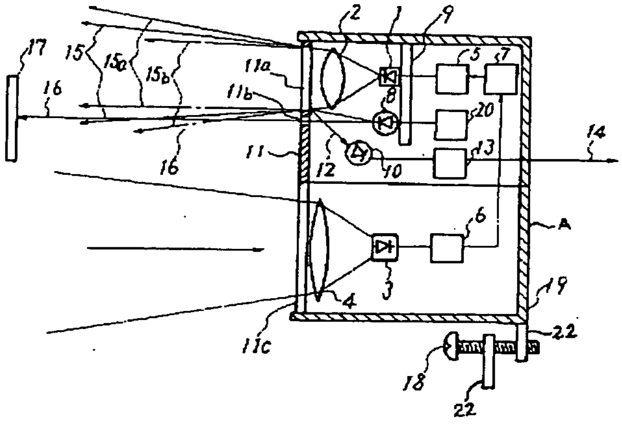
【図２】この発明の一実施例に係る距離測定装置の正面図である。

【図３】従来の距離測定装置を側断面的に示したブロック図である。

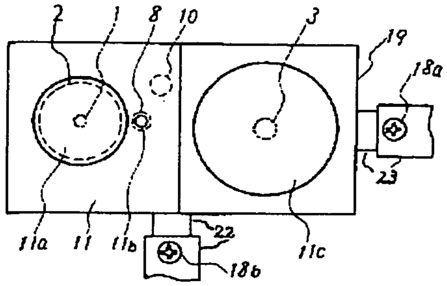
【符号の説明】

１	測距用送光素子
２	送光レンズ
３	受光素子
４	集光レンズ
５	送光素子駆動回路
６	受光増幅回路
７	距離演算回路
８	可視光送出素子
１０	汚れ検知用受光素子
１１	前面カバー
１１ａ	第一の窓部
１１ｂ	第二の窓部
１１ｃ	第三の窓部
１３	汚れ検知用増幅回路
１８ａ、１８ｂ	調節ネジ
１９	距離測定装置
２０	可視光送出用駆動回路
２２、２３	支持部材

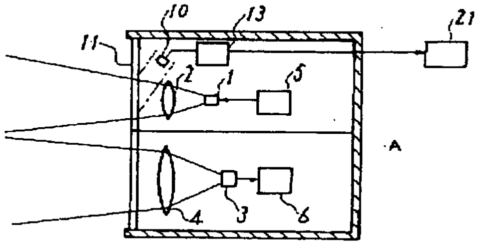
【図１】


A

【図２】



【図３】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